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A.D. 1866, 15th *FEBRUARY*. N° 487.

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S P E C I F I C A T I O N

OF

CHARLES GALL.

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CONSUMING SMOKE IN FURNACES.

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L O N D O N :

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,

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1866.







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A.D. 1866, 15th FEBRUARY. N° 487.

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**Consuming Smoke in Furnaces.**

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**LETTERS PATENT** to Charles Gall, of Bridgnorth, in the County of Salop, Engineer, for the Invention of "IMPROVEMENTS IN APPARATUS FOR EFFECTING THE CONSUMPTION OF SMOKE IN STEAM BOILER AND OTHER SIMILAR FURNACES."

Sealed the 27th July 1866, and dated the 15th February 1866.

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**PROVISIONAL SPECIFICATION** left by the said Charles Gall at the Office of the Commissioners of Patents, with his Petition, on the 15th February 1866.

I, CHARLES GALL, of Bridgnorth, in the County of Salop, Engineer,  
5 do hereby declare the nature of the said Invention for "IMPROVEMENTS IN APPARATUS FOR EFFECTING THE CONSUMPTION OF SMOKE IN STEAM BOILER AND OTHER SIMILAR FURNACES," to be as follows, that is to say:—

This Invention refers to improved apparatus for regulating the admission of air under the beds of steam boiler and other similar furnaces,  
10 and applying such air at the part of the furnace most requiring it, and with this view I employ a fire-bridge, either solid or hollow, with an opening situate as near the top as possible; this opening is covered with a curved plate bent over on the inside towards the fire, and furnished at its lower edge with a flange or rest to receive one end of the fire-bars which lie  
15 upon this flange; this top plate carries the bricks with which the opening



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in the bridge is covered. On the other or flue side of the bridge the opening is guarded by a baffle or damper plate situate a slight distance from the bridge, or in an inclined plane upwards from its lower edge, for the purpose of distributing the air or throwing it into an upward current, as the case may be. The draught or admission of air underneath the furnace bed 5 is governed by a valve, either vertical or horizontal, placed on the inside or fire side of the bridge underneath the curved plate already named; the closing of this valve is regulated by apparatus placed in front of the furnace communicating with the valve by a rod and lever under the bed of the fire. This regulating apparatus may consist of water power applied 10 by means of a vertical rod attached to the furnace door carrying on its upper end half a toothed wheel working into a pinion upon whose spindle is mounted a water wheel with an upward throw, a second smaller wheel, and a winding cord. A small cistern being fixed above the wheels, and a second cistern below, the opening of the fire-door causes the larger wheel 15 to throw the water from the under into the upper cistern. When the door is closed the turning of a tap allows the water to descend through a pipe upon the smaller wheel, causing it to wind the cord, which, being attached to a short arm or lever connected to the bridge valve rod under the furnace bed gradually closes that valve and cuts off the admission of air, 20 so that the greatest quantity of air is admitted when most wanted, when fresh fuel is put on and the supply is cut off, save what comes in under the fire-bars, when the fire is bright and clear. Another form of regulating apparatus would consist in the employment of sand or shot, or other granular substance, operating after the manner of an hour glass, the running 25 of which sand or shot may be made to operate a rod and levers in connection with the valve rod, and thus effect the same result.

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said Charles Gall in the Great Seal Patent Office on the 10th August 1866.

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**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, CHARLES GALL,** of Bridgnorth, in the County of Salop, Engineer, send greeting.

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Fifteenth day of February, in the year of our Lord One thousand eight hundred and sixty-six, in the twenty-ninth 35



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year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Charles Gall, Her special license that I, the said Charles Gall, my executors, administrators, and assigns, or such others as I, the said Charles Gall, my executors, administrators, and assigns, should  
5 at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for “IMPROVEMENTS IN APPARATUS FOR EFFECTING THE CONSUMPTION OF SMOKE IN  
10 STEAM BOILER AND OTHER SIMILAR FURNACES,” upon the condition (amongst others) that I, the said Charles Gall, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within  
15 six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Charles Gall, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the  
20 following statement, reference being had to the Drawings hereunto annexed, and to the letters and figures marked thereon (that is to say):—

This Invention refers to improved apparatus for regulating the admission of air under the beds of steam boiler and other similar furnaces, and applying such air at the part of the furnace most requiring it, and with this view I  
25 employ a fire-bridge, which may be either solid or hollow, and having an opening situated as near the top as convenient, which opening is covered with a plate furnished at its lower edge with a flange or rest to receive one end of the fire-bars; this plate carries also the bricks above the opening in the fire-bridge. On the flue side of the bridge the opening is guarded by  
30 a baffle or damper plate situate at a slight distance from the bridge, and employed for the purpose of distributing the air or throwing it into an upward current, as the case may be. The draught or admission of air underneath the furnace bed is governed by a valve door hung either vertically or horizontally on the inside or fire side of the bridge in the  
35 opening already alluded to, the opening of this valve door being coincident with the opening of the furnace door for the purpose of feeding the fire, and its closing, which is gradual, being governed by regulating apparatus in connection with the furnace door.



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## DESCRIPTION OF THE DRAWINGS.

Figure 1 is an end elevation of a steam boiler and furnace; Figure 2, a longitudinal section of such portion of the same as my Invention applies to; Figure 3, a side elevation upon a larger scale of the water balance regulator; Figure 4, a plan of the same. Similar letters refer to similar parts upon all the Drawings.

(*a*) are the fire-bars resting upon the flanges; (*b*) (*c*) is the covering plate of the opening (*d*) in the bridge; (*e*) (*f*) is the baffle or damper; (*g*) the valve door hung on horizontal centres and connected by a link coupling (*h*) to a rod (*i*) placed under the bed of the furnace, and to which rod (*i*) is attached by a crank connection (*j*) a vertical rod (*k*) which is pinned at its upper end to the under side of one of a pair of water cisterns (*l*) and (*m*) seated on a platform (*n*) hung by a stud and strap (*o*) to the boiler, upon which stud the platform (*n*) is free to work in the direction shewn in the dotted lines (Figure 1). The cisterns (*l*) and (*m*) are coupled together by a slotted band (*p*), (Figure 4), the slots therein admitting of the exact fixing of these cisterns by the regulating screws shewn, so that an accurate balance may be ensured; the cisterns (*l*) and (*m*) are further connected by a pipe (*q*) and a second or smaller one (*r*) the latter being furnished with a stop-cock. Upon the under side of the platform (*n*) are fixed two T shaped levers or arms (*x*) and (*y*) between which is a pointer or finger (*s*) attached by a crank to a vertical rod (*t*) passing upwards from the rear side of the furnace door (*v*). Thus far I have described only the parts of which the apparatus is composed; I will now proceed to shew its action, assuming that the apparatus is in the position shewn in strong lines in the Drawings, which is that which it would occupy when the furnace required feeding. The opening of the furnace door (*v*) would through the action of the rod (*t*) and the finger (*s*) operating upon the lever arm (*x*) tilt the platform (*n*) and the cisterns (*l*) and (*m*) into the position seen in the dotted lines, causing the water in the cistern (*l*) to flow through the pipe (*q*) into the cistern (*m*), and by means of the vertical rod (*k*) and its connection to the rod (*i*) by which the valve door (*g*) is worked the valve door (*g*) is opened at its widest at this time. At first starting the apparatus, upon closing the furnace door (*v*) after feeding, the engineer would turn the stop-cock in the smaller pipe (*r*) and thus allow the water to run from the cistern (*m*) back into the cistern (*l*), and thus reversing the action of the parts already described the valve door



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(g) is gradually closed, until the feeding of the fire again requires the admission of more air, when the same operation is repeated by the opening of the furnace door.

Having thus described the nature of my said Invention, and in what  
5 manner the same is to be performed, I do not confine myself to these  
precise details, but that which I claim is, the arrangement and combination  
of the several mechanical appliances, herein described, and illustrated by  
which a graduated draught or current of air is admitted to the fire of  
steam boiler and other furnaces, at the time and at the part of the furnace  
10 at which it is most requisite, thus ensuring the consumption or combustion  
of the smoke and gases, as herein more fully set forth and specified.

In witness whereof, I, the said Charles Gall, have hereunto set my  
hand and seal, this Fourth day of August, in the year of our  
Lord One thousand eight hundred and sixty-six.

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CHARLES (L.s.) GALL.

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Printers to the Queen's most Excellent Majesty. 1866.





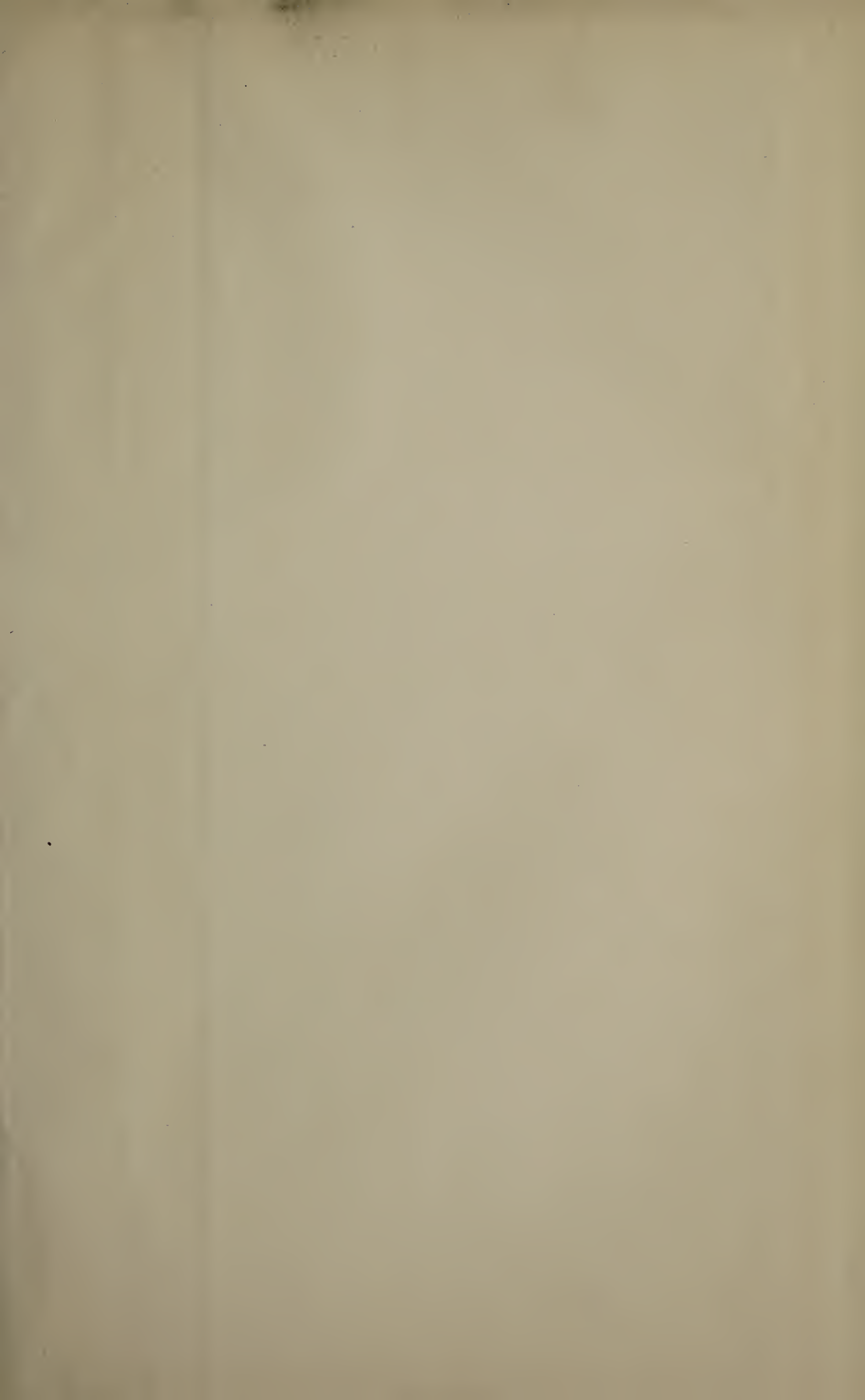






FIGURE 2

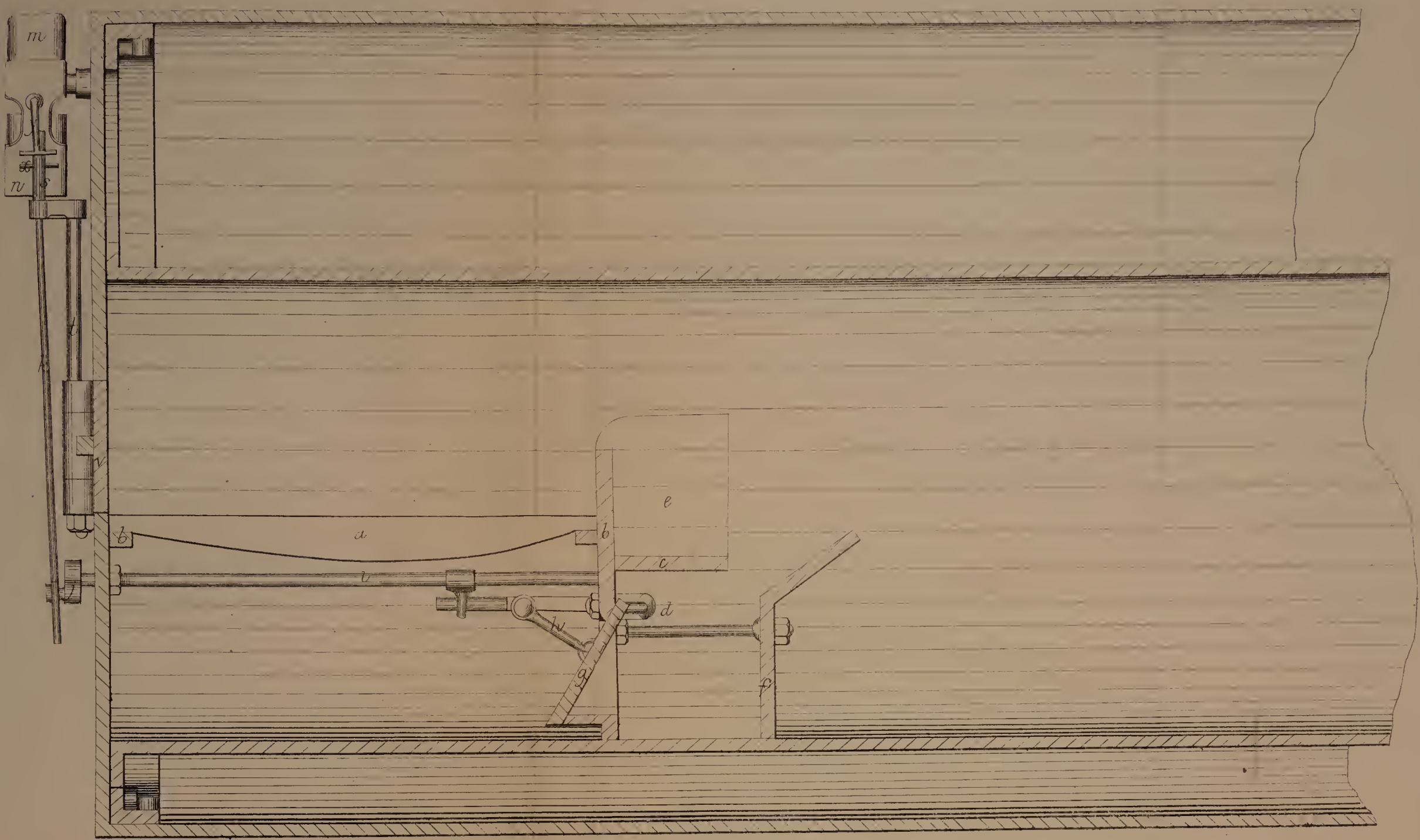


FIGURE 1

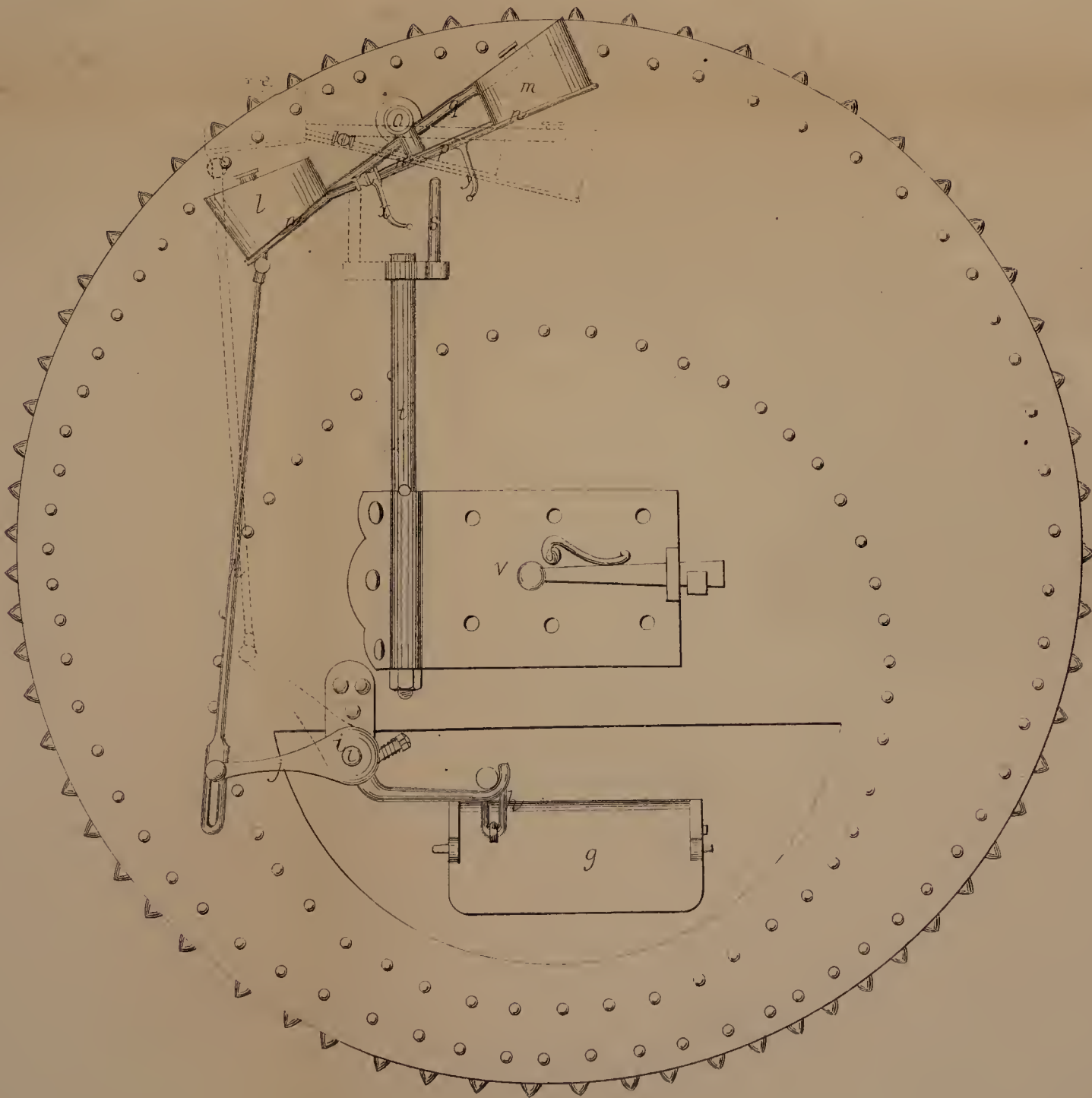


FIGURE 3

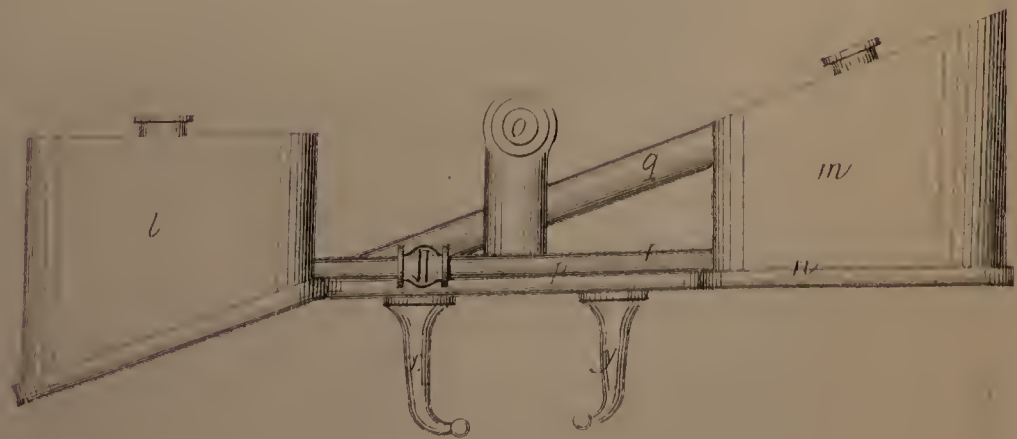
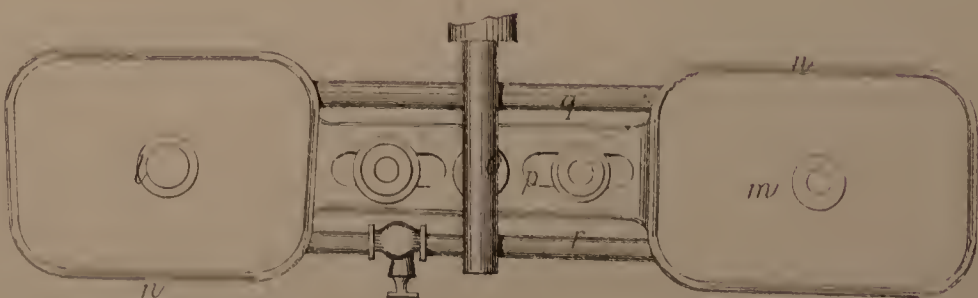


FIGURE 4



The filed drawing is partly colored.

Drawn on Stone by Malby & Sens

